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USSR Report

CYBERNETICS, COMPUTERS AND AUTOMATION TECHNOLOGY

FBIS FOREIGN BROADCAST INFORMATION SERVICE

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SOFTWARE

GENERAL

INTRODUCTION OF MICROPROCESSOR TECHNOLOGY

Moscow PRAVDA in Russian 9 Jun 85 p 2

[Article by E. Yegizaryan, member of Academy of Sciences USSR Scientific Coordination Council for Semiconductor Converters, and N. Lokhov, engineer and mathematician,"Magic Chips-Innovation from Idea to Embodiment"]

[Text] Who has not been to the doctor? Everyone can list his uncomplicated instruments: stethoscope and thermometer, small spoon in order to inspect the throat and also an instrument for measuring arterial pressure. More than this sort of thing is not necessary. And if it is necessary then the doctor writes out a recommendation for treatment by specialists.

But, just for a moment, imagine another picture: the medical worker whom you consult asks you to attach to your chest or wrists certain sleeves which resemble those used for measuring pressure. You hear the familiar words "breathe", "don't breathe" and your light respiration rises and falls on the screen of the microcomputer on the corner of the doctor's table while the cardiogram lines uncoil and lines of numbers appear describing the state of your health. And after five or ten minutes the doctor obtains from the machine a set of possible diagnoses of your disease by introducing into the machine the answers to the questions "where does it hurt, what is the complaint". A complex of semiconductor microtransducers which are fundamentally new measurement technology devices sewed into the sleeve made it possible to find out all that was required as to our organism rapidly and with high precision.

Fantasy? Not at all. The semiconductor transducers are capable of revolutionizing more than the field of medicine. The silicon chip of the size of a pea or even of a poppy seed reacts sensitively to variations in the environment by means of variations in its own electric characteristics. This makes it possible to use the "magic" chips as measuring devices for all possible values: temperatures, pressures, forces, accelerations, deformations, vibrations, chemical composition characteristics and light waves. These are very precise and reliable measuring devices which are completely compatible with microprocessor electronics and are very cheap.

It is as if semiconductor microtransducers and microprocessors were created in order to work together "in harness". Both were fabricated by the same highly productive manufacturing process which in series production accounted for their low price of not more than 50 kopecks or even tens of kopecks per piece. The

microtransducers and microprocessors require a thousand times less energy than traditional measuring equipment and information processing methods. In addition, information on the physical values which the microtransducers collect is produced in exactly the form which is necessary for the work of the microprocessors which makes it possible to eliminate many intermediate links in the processing of measured data. Most important of all, several microtransducers of different types (for temperature, pressure, chemical composition, etc.) and microprocessors can be located on the same silicon "pea". This chip weighing several grams replaces a set of measurement and control devices which today, in the most favorable case, would fill several bulky cabinets.

Today the economy of the country could already require several million microtransducers annually, end the present shortage in measurement technology and simply eliminate traditional transducers whose metrological, functional and economic indicators are, according to the general conviction, far behind current requirements. The economic effect obtained through the cheapness of the microtransducers alone would, according to the most modest estimates, amount to hundreds of millions of rubles.

But the greatest profit to the society would come from the high precision and reliability of these devices. It is known that not less than 60-70% of all technical failures and deviations from standards are due only to the unsatisfactory quality of the measurement equipment or its unavailability. And in plain language, deviations from standards mean low quality production and waste of energy and resources. Sometimes the unavailability of large numbers of the necessary instruments even makes the standards inapplicable. For example, use of precise measurement equipment for testing concrete structures would make it possible to more precisely compute their strength and to reduce consumption of materials.

Semiconductor microtransducers are an important component of flexible automated production equipment which is capable of converting to series production of new items in a very few days or even hours.

Precise measurements are necessary everywhere. This includes cases in which it never entered our heads until now that there was anything to measure. Just think, and not everyone knows this, that the control keyboard of personal computers is more expensive today than the electronic insides. Here the use of microtransducers not only makes the keyboard cheaper and more reliable but also gives it new possibilities. For example, it can automatically and without effort keep track of whether the operator is tired or needs a moment of rest.

But what, in general, are the areas in which measurements are primary? Why, for example, do chemical technologies sharply distinguish between results obtained in the laboratory and in industrial reactors? They do so because, under industrial conditions, the precision of laboratory measurements cannot be obtained. Consequently, achievments in the laboratory are not reproduced. But remember those transducers and microprocessors. Several tens of "magic" chips on a reactor and the production worker obtains the possibility of continuous control of a quantity of process parameters with levels of precision of which he had not even dreamt before.

Let us now consider internal combustion motors. As we know, in optimal functioning regime these motors require 30% less fuel for the same power output. Their safe life is increased by 10%. Worldwide experience has shown that in order to achieve this it is sufficient to install 30-40 microtransducers and one microprocessor on the automobile.

It turns out that for the needs of our automobile industry alone there will be required in the near future tens of millions of microtransducers. An enormous number will be needed in order to supply every doctor with an automated diagnostic unit as described at the beginning of our article. And what about agriculture where precise regulation of the microclimate at a small farm could lead to additional production of up to two hundred tons of meat. Couldn't programmed farming carried out on the same fields and with the same varieties considerably increase harvests? What about maintaining optimal conditions in general storage facilities which would be able to keep losses to a minimum? All this means millions and millions of microtransducers and microprocessors.

In short, in our view, it should be very clear today that simple and cheap microtransducers are irreplaceable helpers for all those who solve practical problems concerning the intensification of the economy. Therefore why don't we now have such devices in the necessary quantities? We are not producing a single type of microtransducer in series in this country at the present time. What is the matter here? Have specialists looked into the problem? Are there no specialists of this kind? Are the resources insufficient?

Not at all. The resources are sufficient. At the proper time an evaluation was made of the scientific discoveries on the basis of which microtransducers operate. But the matter stopped there. Today microtransducers are made only on special orders as individual units. A group of enthusiasts to which one of the authors of this article belongs developed original designs and created test specimens, technical documentation and fabrication technology for thirty kinds of transducers. But the volume of the design, engineering and organizational problems which must be solved in order to overcome the lag which had built up is enormous. The problem requires special attention.

At the present time it would be difficult to make specific complaints as to any particular government department. The Ministry of Instrument Making, Automation Equipment and Control Systems? It seems to be innocent because although the microtransducers appear to be instruments their production, as concerns fabrication technology, is assigned to the Ministry of the Electronics Industry. But it appears that this ministry is also innocent since it is not concerned with measurement technology. The same can be said for other ministries. Sometimes they simply do not have the corresponding material base nor the researchers and engineers with the required profile.

According to the decision of the Ministry of Instrument Making, Automation Equipment and Control Systems and the Academy of Sciences USSR Scientific Council on the problem of "Semiconductor physics and chemistry" the scientific and technical administration of the ministry was directed in 1984 to solve the problem of the organization in branches of a center on semiconductor primary converters. However no action has been taken up to now.

The microtransducer which is a typical creation of the scientific and technical revolution originated as a result of the interaction of several sciences and is capable of revolutionizing many sectors of the economy. But there is a popular saying that water does not flow under a stone lying immobile on the ground. In our view it is now the time to develop scientific research and experimental design development in the sectors themselves which are consumers of microtransducers: medicine, aviation, automobile construction, chemical and food industries, etc..

This matter cannot be handled without a program-goal approach. First of all it is necessary to identify the main problems and to form from them a carefully considered "target tree" and then to create a program for specific actions and to begin to finance the execution for specific targets.

The enthusiasm and energy of innovators should be directed towards a search for the best technical and organizational solutions and not for a "break-through" across institutional barriers. The program-goal organization is intended to stimulate enterprises and organizations to "hunt" for innovations and actively search for them and not to oppose them.

The "magic chips" involve difficult problems. But we cannot do without them today and this will be even more true tomorrow. It is necessary to do everything possible so that they will reliably serve people at every work site.

12497
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GENERAL

ROBOTICS TECHNOLOGY

Kiev PRAVDA UKRAINY in Russian 25 May 85 p 2

[Article by M. Zherebkin "Taming Robots-Technical Progress: New Machines and Equipment"]

[Text] The Kharkov plant team of specialists in industrial equipment introduced series production of universal robots which were displayed last year at the VDNKh SSSR (USSR Exposition of Economic Achievements) and were awarded medals.

The robot did not want to work. All the efforts of the specialists surrounding it were in vain. It did not listen to the commands of the chief engineer A. Zaretskiy and the designer A. Mironov and did not carry out the requests of the mechanic G. Streltsov who, with his own hands, had assembled it from beginning to end and who now seemed to be the most distressed of all. The testing of the prototype had failed. This was clear to all. And when the robot was ordered to extend its hand forward and it swung to the right this even caused laughter.

"The firstborn was capricious," some joked.

"And the rest will be the same way," others predicted.

The former factory for tobacco machinery construction which was designated by the USSR Ministry of Machine Building for Light and Food Industry (Minlegpishchemash) a plant for special industrial equipment was converting to the manufacture of new products. The enterprise had been assigned the role of fabricator of equipment for the mechanization and automation of production processes based on the broad application of robotic complexes.

Team members reacted differently to the planned reorganization. Many were troubled by something like a psychological barrier. It is one thing to produce elementary mechanical equipment and a completely different matter to produce electronic equipment. It took six months to assemble the first five Krym-10 model robots. It was hoped that successful tests would be the most weighty argument in the discussion with sceptics and the best support for enthusiasm. Unfortunately, the reverse turned out to be true. The first pancake, as they say, was lumpy.

Where and in what was the miscalculation made? One of the robots was disassembled

into its components and elements and everything was tested. They arrived at the disquieting conclusion that there had not been the required cleanliness and precision in the processing and assembly. What had been done previously without eliciting complaints from supervisors was now simply waste.

Not only were the technical level of the plant and the professional skill of the workers and spcialists insufficient but the design work was also not suitable for the production process and therefore the product was not effective. Here is only one example. In order to raise a load with a weight of 10 kg it was planned to lift half a robot with a weight of 150 kg.

"It's like a helicopter," laughed wits at the plant, "it lifts the load and itself as well. Let's hope it doesn't wear itself out."

The developers who were specialists at the Krymsk PKTI (Structural Design and Technological Institute) convinced themselves with their own eyes of the drawbacks of the design and the factory workers saw even more clearly that their work was insufficient. They considered a new design together.

At the same time, they began to realize a comprehensive program directed towards the technical refitting of production facilities at the plant. What has been done? There has been complete replanning of old sections and the creation of new ones. Advanced production processes have been introduced. In the casting section, for example, they began to produce molded castings. This made it possible at the site itself and using the same number of workers to increase production by one and a half times. In the electroplating section they introduced the heavy chrome plating process. All this was done in order to raise the level of precision and cleanliness in the production of parts. If they couldn't do something with their own resources they turned to other enterprises for help.

During this period a quarter of the equipment was replaced. The technical level of the plant rose and work productivity went up by 21%. It was also said that almost all the workers followed special courses in which they studied the design of robots and advanced processing and assembly methods.

This was a difficult period in the life of the enterprise. It became more complex and thus the first tests were unsuccessful. But the managers of the plant and the director I. Bulgakov were able to explain to the staff the reason it was necessary to work especially intensively now. There were promising perspectives. The robots were bringing the plant out of the secondary category into the first rank of scientific and technical progress.

However the main achievement was probably not the successful execution of the technical reequipment but the qualitative changes in the staff itself which were carried out imperceptibly but were felt with ever increasing intensity. This was a period of accumulation of forces and of ripening for larger matters. Around the designer E. Mironov heading the robot design team a group formed of creative engineers and thoughtful workers capable of initiative including G. Streltsov, V. Gopta, G. Khodakovskiy and others.

Therefore it is by now completely natural that the new robot model MPUS-10 was able to go through all the fabrication processes without any failures and to pass

the tests. By this time the robots were no longer something exceptional and they began to produce them quietly, with confidence and at a regular rhythm.

The plant specialists and advanced workers were attracted by the new occupation and worked with interest so that if everything worked out they obtained satisfaction and if something didn't turn out right they were distressed. They were not passive and indifferent and this accounted for half of the future success.

Thus the robot became universal. It can automate the operations for transport of parts to the machines with numerical control, press equipment, quenching units and for the assembly of elementary units. The hand has three programmed stops for turns and three for extension. This makes it possible for users to considerably reduce the area occupied by the robotic complex which is especially important for the reconstruction of operating enterprises and for the introduction of flexible automated systems. Customers estimated that the resetting of the robot for a new program did not take more than three minutes and can be carried out by a shop technician.

The demand for universal robots is growing. 50 units will be built this year.

Our conversation with chief engineer E. Zaretskiy was interrupted by E. Mironov. Eduard Vsevolodovich rushed into the office.

"Look," he said to Zaretskiy and turned the small mechanism for raising the wrist of the hand from a vertical to a horizontal position. "What if we make up the entire hand of the robot on this principle?"

"You want to take the load from the cylinder rod and put it on the control part?"

"Yes."

"But what will be the advantage?"

"I think that we can increase the load-lifting capacity, reduce the size and lower the metal content."

This is how still another of the energetic Mironov's ideas appeared. He hadn't particularly been thinking about it. It came to him suddenly. But there was nothing unexpected here. On the contrary it was all perfectly natural. This is the way it always is with people whose normal state is constant searching and creation.

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UDC: 681.51.015.26:[681.325.5:621.3.049.77]

SPECIALIZED MODELING SYSTEMS AS A MEANS OF AUTOMATING THE DESIGN OF MICROPROCESSOR DEVICES

Moscow IZMERENIYA KONTROL' AVTOMATIZATSIYA in Russian No 3, May-June 84 pp 69-76

GITIS, E. I., Doctor of Technical Sciences and MOGUYEVA, O. V., Junior Scientific Fellow.

[Abstract] An attempt is made to systematize publications which have appeared in the past decade on the problem of automation of the design of microprocessor devices. Primary attention is given to the use of specialized modeling systems for the development of devices based on microprocessor systems and their software. Both hardware and software microprocessor design systems are discussed. A number of domestic dialogue specialized single-level modeling systems are presently known. All are based on the same principle: the microprocessor device being designed, the object of modeling, is described as a set of basic elements - integrated digital, analog and microprocessor elements - and communications among them. U.S. systems such as SARA and DEC'S SAGE 2 are described. Requirements are formulated for software used in the design of miroprocessor-based devices and systems. Modeling devices should: allow modeling of both hardware and software; allow modeling of devices at several levels; include microprocessor models allowing easy modeling of parallel processes; allow rapid adaptation to new types of microprocessors and new instruction sets; allow determination of the time, accuracy and reliability characteristics of devices; and be convenient both for programmers and for developers. Figures 3, references 28: 19 Russian, 9 Western. [131-6508]

UDC: 681.326.001

PROGRAMMABLE DEVICE FOR MONITORING AND DEBUGGING CONTROL SYSTEMS BASED ON THE KR580IK80A MICROPROCESSOR

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84 (manuscript received 22 Nov 83; after revision 1 Feb 84) pp 25-27

VIGDOROV, D. I., SHCHIRIN, G. V., ISAKHANOV, E. S. and BABAYEV, S. S. (Azerbaydzhan Institute of Petrochemicals, Baku)

[Abstract] A method is described for constructing a monitoring and debugging device for microprocessor systems with expanded service functions allowing easy modification and supplementation of debugging operations by software alone, and placing no limitations on the system memory address field or system software. The design of the device is based on automatic switching of microprocessor memory select signals and debugging device memory at fixed moments in the instruction select cycle and instruction operation cycle. The microprocessor of the system being tested remains in the automatic operating mode at all times. All debugging operations are controlled by programs recorded in debugger memory. The debugger and device being debugged are connected by the address, data and control buses and memory select enable lines. A time diagram of the operation of the device is presented. The device can increase the effectiveness of debugging and can be recommended as a simple portable device for debugging and diagnosis of microprocessor systems. The device has been realized at the Azerbaydzhan Institute of Petrochemicals imeni M. Azizbekov using a KR580IK80A microprocessor. Figures 3, references 7 Russian.
[151-6508]

UDC: 681.3.014

CONTROL OF PROCESSING OF INFORMATION STREAMS IN THE 'ELEKTRONIKA-60' COMPUTER

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84 (manuscript received 12 Apr 83; after revision 14 Nov 83) pp 40-42

TUYAKHOV, L. S. and ALEKSANDROVA, J. A. (Donetsk)

[Abstract] A study is made of the principles of organization and algorithms of functioning of a control program intended for use in various automated systems for processing (servicing) streams of information. Buffer memory is used to store all input and output messages in system memory until the input messages can be serviced, and the output messages can be transmitted. The buffer thus supports operation of the system under extreme conditions. The queueing system used is described. The use of a system of files for storage of temporary data allows the sequence of inspection of input-output message registers and the priority of message servicing to be altered. Several queues are maintained in the system. The program which supports the

system is approximately 5,000 machine words in length and can be used to process information on microcomputers for which no standard operating systems exist. The mean time characteristics of several stages of processing are listed. References 4 Russian.
[151-6508]

UDC: 681.3.06./94

A NEW APPROACH TO THE CONTROL OF THE CURSOR IN AN INTERACTIVE GRAPHIC DISPLAY

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84 (manuscript received 28 Nov 83; after revision 3 Feb 84) pp 115-117

PETUKH, A. M. and SILAGIN, A. V. (Vinnitsa Polytechnical Institute)

[Abstract] The authors suggest a new method of cursor control using a transparent sensor panel mounted in front of the display screen. The panel is a sensor matrix with 16 x 16 or 32 x 32 discrete positions and is used in video terminal systems to input information concerning the position of a desired character on the screen. A high speed touch panel using TTL sensor technology has been developed for experimental testing of the method. All 16 x 16 locations are interrogated in approximately 3.5 microseconds. The software imitates the operation of a track ball. Figure 1, references 6 Russian.
[151-6508]

UDC: 681.323

MULTIPROCESSOR INTEGRATING COMPUTER STRUCTURE FOR CONSTRUCTION OF HIGH PRODUCTIVITY MODELING SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 4, Jul-Aug 84 (manuscript received 30 Jun 82) pp 14-17

GUZIK, V. F., IVANOV, V. P. and KRIVORUCHKO, I. M.

[Abstract] A method is suggested for construction of multiprocessor integrated computer structures allowing the creation of a powerful computer structure using an acceptable quantity of hardware with a fully accessible switching system. The initial task is presented in a high level language oriented towards a system with the characteristics of algorithms and structural organization of computations applicable to the situation. A cross compiler is used which yields a so-called translation graph. Special programs are used to compute scale relationships and initial conditions and to solve the problem of synchronizing the computational process. The simplicity of changing the characteristics of the system during the development stage allows automation of the process of planning of systems, significantly reducing the time required for development and introduction of highly effective computer systems to production.
[165-6508]

UDC: 681.3-181.4.001.42

USE OF SIGNATURE ANALYSIS IN MICROPROCESSOR SYSTEMS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 6, Nov-Dec 84 (manuscript received 14 Mar 83) pp 16-22

KUDRYASHOV, V. I.

[Abstract] The method of signature analysis searches for defects with a special instrument, the signature analyzer, by successive comparison of standard signatures with signatures obtained from a device being tested. A defective element is one which receives a standard signature at its input but produces a nonstandard signature at its output. A signature is a hexadecimal number which is displayed on the signature analyzer. Searching for defects consists of comparing two hexadecimal numbers, one of which is recorded in the dictionary of standard signals, while the other is displayed on the indicator. The signature analyzer is a compact portable measurement device which is connected to the device being tested only during the test operation. The dictionary of standard signatures defines the algorithm used to search for defects. Signature analysis allows an operator without extensive training to localize defects in complex digital devices. Figures 4, references 6 Russian.
[170-6508]

UDC: 621.318.681

COMPUTER MODELING OF VOLT-AMPERE CHARACTERISTICS OF NONLINEAR SEMICONDUCTOR CONGLOMERATES

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 6, Nov-Dec 84 (manuscript received 9 Sep 82; after revision 20 Jan 83) pp 22-26

MAYOR, Ye. A. and KHARITONOV, Ye. V.

[Abstract] The problem addressed in this article is one of determining the VAC of a polycrystalline material on the basis of the known VAC of contacts between grains and known structure of the polycrystalline conglomerate. The structural parameters depend on technological factors in the manufacture of the material such as grain size, heat treatment and pressing pressure, so that VAC determinations can be used to determine the optimal technology for production of a material with assigned properties. The volt-ampere characteristics of a conglomerate model were constructed by solving a system of equations for currents in an equivalent circuit for each fixed value of voltage. The equations were composed by analyzing a portion of the flat cross section of a model structure of a nonlinear material. The entire process consists of selecting and composing the equivalent circuit, selecting the type of characteristic of intergrain contacts, assignment of random values to equivalent circuit elements based on the known distribution, testing of the stability of

the individual electrical characteristics of model structure with respect to its volume, and construction of the VAC from the solution of the system of equations for currents for various values of input voltage. Figures 4, references 14: 12 Russian, 2 Western.
[170-6508]

UDC: 681.32

ESTIMATE OF DISTRIBUTION OF FREE AREA OF COMPUTER RAM

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 19 Mar 82; after revision 31 May 82) pp 110-113

LOMOV, Yu. S., MAL'SHAKOV, V. D. and TIMOSHENKO, A. R.

[Abstract] The selection of RAM organization determines the effectiveness of functioning of an entire computer system, particularly in multiprogramming systems. A study is made of RAM organization using moving partitions. This organization eliminates fragmentation, since all free RAM is combined into a single segment and can be allocated to one or more processes in the FIFO process queue. Equations and a flow chart describe the process of RAM reallocation. Figures 3, references 2 Russian.
[165-6508]

UDC: 681.327

CONNECTION OF PERIPHERAL DEVICES TO A HOMOGENEOUS COMPUTER SYSTEM

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 6, Nov-Dec 84 (manuscript received 1 Dec 83) pp 60-64

KUDRYASHOV, V. N. and MAMZELEV, I. A.

[Abstract] A homogeneous computer system is a set of elementary machines interacting through a regular program controlled network plus peripheral devices acting as external storage, I/O devices, etc. This article studies a method of connecting peripheral devices to the system by means of peripheral device buses. The number of peripheral devices and computers connected to each bus is not limited by the structure. It is assumed that each peripheral device and elementary computer is connected to all buses. This allows connection of any peripheral device to any computer. Calculation equations are obtained allowing computers to calculate the values of structural reliability of subsystems servicing peripheral devices and to determine the sensitivity of structural reliability to changes in reliability of individual elements, including computers, peripherals and buses. The parameter of sensitivity is introduced, allowing the least reliable parts of the system to be determined. With sufficiently reliable elements, it is not desirable to use more than two

peripherals of the same type in a subsystem. The vector function of structural reliability of subsystems is reduced, which can be used in creation of computer system management programs to consider the reliability parameters of peripherals and interfaces. Figures 3, references 8 Russian.
[170-6508]

UDC: 681.323

SELECTION OF COMPUTER DEVICES FOR REAL TIME DIGITAL MODELING

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 6, Nov-Dec 84 (manuscript received 22 Sep 82) pp 97-99

GUZIK, V. F., KRIVORUCHKO, I. M. and YEVTEYEV, G. N.

[Abstract] The conditions of operation of a single-processor digital computer in real time are analyzed. The use of multiprocessor computers for real time modeling can significantly improve productivity, removing limitations inherent in single-processor operation. It is demonstrated that the condition of real time modeling for multiprocessor computers is independent of the characteristics of the problem being modeled, its complexity and connectivity, rather placing demands only on the parameters of the computer system. A figure classifies computer systems in terms of characteristics and area of application. The only limitation placed on modeling tasks is that they should not contain hypertranscendental functions. Figure 1, references 5: 4 Russian, 1 Western.
[170-6508]

UDC: 681.325.65

ALGORITHM FOR DETERMINATION OF CONNECTION LIST IN DESIGNING ELECTRONIC COMPUTER APPARATUS

Leningrad IZVESTIYA VYSSHIKH UCHEBNYKH ZAVEDENIY: PRIBOROSTROYENIYE in Russian No 12, Dec 84 (manuscript received 16 Apr 84) pp 29-34

POLYAKOV, V. I. (Leningrad Institute of Precision Mechanics and Optics)

[Abstract] One of the major tasks in the engineering stage of designing electronic computer devices is placement of elements and layout of connecting tracks. Layout includes determination of the list of connections, distribution of connections among board layers and determination of the sequence of application of connections. This article discusses an algorithm for determining the list of connections to minimize the number of different pairs of elements. The article constructs connection trees minimizing the total connectivity of elements describing the electrical circuit by a matrix of sets, the rows corresponding to elements, the columns to circuits. The algorithm can be used in systems for automated design of printed circuit design. Figure 1, references 5 Russian.
[171-6508]

UDC: 681.327.8+621.317

DEVICE FOR CONNECTING 'ELEKTRONIKA D3-28' MICROCOMPUTER TO EXPERIMENTAL INSTALLATIONS

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 6, Nov-Dec 84 (manuscript received 31 Jan 84) pp 70-73

AFONIN, Yu. D., SHALAGINOV, V. N. and BEKETOV, A. R. (Urals Polytechnical Institute, Sverdlovsk)

[Abstract] A multichannel communications coupler has been developed for the D3-28 computer allowing input of information to the D3-28 and output of control signals to actuating and controlling devices. The communications unit consists of the information input block, control block, and information input block. The device is diagramed and its operation is briefly described. The device allows information I/O through four channels of input, eight channels of output, plus input of information from seven sensors through a single channel. The device is designed for complete automation of the process of control of experimental installations with recording of data. Figures 3, references 3 Russian.
[174-6508]

UDC: 681.327.8+621.317

INTERFACE FOR PROCESSING PULSE SIGNALS WITH THE SM-3 (SM-4) COMPUTER

Moscow PRIBORY I TEKHNIKA EKSPERIMENTA in Russian No 6, Nov-Dec 84 (manuscript received 14 Mar 83; after revision 11 Oct 83) pp 73-76

LEVKO, I. A. and YAMNYY, V. Ye. (Belorussian State University)

[Abstract] An interface is described which satisfies the requirements for a highly reliable digital signal processing system. The interface allows reception of up to sixteen signals in sequence, alteration of the size of the data sets received within arbitrary limits in order to match with various buffer memory devices. Information is transmitted by direct memory access to memory at about 10^6 sixteen-bit words per second. The device includes a DMA interface, data set definition unit, actuating device interface and instruction and status registers. A structural diagram of the interface is presented. The device is constructed of TTL microcircuits. Testing has shown that the interface can be successfully used in various measurement systems, including systems operating in real time. Figure 1, references 4 Russian.
[174-6508]

UDC 681.3.06

ANALYTICAL EVALUATIONS OF COMPUTER DESIGN QUALITY DURING STRUCTURAL STAGE

Kiev KIBERNETIKA in Russian No 6, Nov-Dec 84 (manuscript received 24 Dec 82) pp 49-56

KURGAYEV, A. F.

[Abstract] Analytical estimates are developed for the characteristics (difficulty of technical implementation, productivity, and reliability) of a problem-oriented computer, or of individual computer devices, in the structural design stage. Analytical relationships are derived that can be used in practice to formulate approximate requirements for the characteristics, and to select the components, of simple (serial) computer systems of differing degrees of complexity on the basis of the requirements imposed for the system as a whole. These relationships can be employed after the components of the system have been selected. Tables 3, figures 2, references 10: 8 Russian, 2 Western.
[195-6900]

UDC 621.373.826

LASER SYSTEM FOR OUTPUTTING DIGITAL SYNTHESIZED HOLOGRAMS FROM COMPUTER TO PHOTOTHERMOPLASTIC TAPE

Kiev KVANTOVAYA ELEKTRONIKA in Russian No 27, 1984 (signed to press 10 Oct 84), (manuscript received 4 July 83) pp 64-68

GIRNYK, V. I., KURASHOV, V. N., NAKHODKIN, N. G. and SHUMILOV, V. N., Kiev State University imeni T. G. Shevchenko

[Abstract] A laser system for outputting binary and half-tone information from a computer to photothermoplastic film on a flexible base is described. The system incorporates a recording channel, a controller, a channel to reproduce and monitor the recorded holograms, a tape transport unit, a computer, and a coherent radiation source with λ=0.4416. One portion of the optical channel is used to record the synthesized holograms as well as to reproduce and monitor them. The parameters of the synthesized filters are identical in each write cycle, inasmuch as the decision-making process is based on measuring the absolute values of the intensity of the correlation responses. The experimental results agree with statistical investigations made on similar thermoplastic photoconductor tape abroad. The tape is promising for use in efficient systems for outputting information from computers that satisfy the requirements for use in hybrid optical-digital complexes. Figures 3, references 6: 5 Russian, 1 Western.
[292-6900]

UDC: 681.3.06

PREPARATION OF SOFTWARE BY ASSEMBLY FROM FINISHED COMPONENTS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84
(manuscript received 21 Apr 83; after revision 26 Mar 84) pp 62-64

DVORTSIN, V. I. and PROKUDIN, G. S.

[Abstract] A method is described for assembly of finished software components in the OS YeS operating environment intended to overcome difficulties including the need to interface modules written in different languages, the strong dependence of most software on structure and types of data processed and the need to preserve interrelationships among components in terms of control. The method suggested for combination of load modules consists of specific utilization of the Os YeS job control system which allows assignment of predicates of arbitrary form. The essence of the method, called SVYAZKA, is automatic reading of job control language texts from sections of a special job library in the sequence corresponding to the assigned structured logic system for transfer of control to finished load modules. The automatic nature of the process is achieved by dynamically calling input system programs from each last step of the job in the sequence required from the library. Experience in utilization of the SVYAZKA system indicates that the method is quite useful for development of application software from finished components. Where components are not standardized, the method allows significant reduction of both time and labor consumption in assembly of software. References 4 Russian. [151-6508]

SOFTWARE HOLDINGS IN THE ALGORITHM AND PROGRAM COLLECTION OF THE UKRAINIAN SSR ACADEMY OF SCIENCES

Kiev UPRAVLYAYSHCHIYE SISTEMY I MASHINY in Russian No 3, May-Jun 85 pp 126-127

[List of software at the Algorithm and Program Collection of the Ukrainian SSR Academy of Sciences]

[Text] Lyashko, S. I., and Mirzoakhmedov, F.

ALGORITHM OF SIMULTANEOUS IDENTIFICATION AND OPTIMIZATION (BESM-6, FORTRAN, "Dubna", DISPAK) Institute of Cybernetics, Ukrainian SSR Academy of Sciences, Kiev, 1980, 31 pages -- Identification No 5895.

The authors give a description of an algorithm and a program using a numerical method of solving stochastic programming problems in the case when the function being optimized contains an unknown parameter which is observed independently. To solve this problem, the authors proposed an analog of the known method of linearization in which the optimization problem is solved simultaneously with the identification of the unknown parameter. Application areas: in stochastic programming problems, problems of the theory of control, noise filtering. Computation time of the test problem -- three minutes.

Mikhalevich, V. S., Yermolyev, Yu. M., Loskutov, V. G., Golodnikov, A. N., Malyukov, V. P., Nosov, A. M., Uryasyev, S. P., Chepurnoy, N. D., Royenko, N. V., Merkulov, I. V., Gupal, A. M., Kononchuk, V. S., Novoselov, V. V., Petrosyan, S. A., and Makarenko, A. D.

PACKAGE OF PROGRAMS OF NON-DIFFERENTIABLE AND STOCHASTIC OPTIMIZATION (YeS1060, PL-1, ASSEMBLER, OS YeS, versions 4.1 and 6.1) Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, Special Design and Technological Office for Software, Ukrainian SSR Academy of Sciences, Kiev, 1981, 373 pages -- Identification No 5927.

This package of programs makes it possible to solve problems of nonlinear and stochastic programming with non-differentiable objective functions, as well as large-dimension problems of linear programming with the block structure of the limitation matrix. The maximum dimension of problems is 8000 variables. It works in the batch and dialogue modes. The assignment is formulated to the package in a problem-oriented input language. The package is automatically

adjusted the volume of free main memory of the computer. Application areas; design projects, prediction and planning of activities. The minimum main memory volume: 7200 K bytes. The package volume comprises 50,000 PL-1 operators and ASSEMBLER instructions.

Kozlik, G. A., Gaynicheru, M. I., Chabanyuk, V. S., Ostapovich, V. N., and Itskovich, N. S.

PACKAGE OF APPLIED PROGRAMS FOR THE ANALYSIS OF GRAPH MODELS (YeS 1022, FORTRAN-IV, DOS YeS, version 2.2) -- Chernovtsy Branch of Kiev Institute of Automation, 1981, 56 pages -- Identification No 5933.

Algorithms and software are proposed for the analysis of graph models. Their main purpose is to give an ASU [automated control system] developer the possibility of rational organization of the software or information support which are described by graph models. The package is used at the stage of the development of structural components of ASU and realizes the following main functions: 1) analysis of a subset of odd-length cycles of a graph model and its division into two minimally connected subgraphs; 2) analysis of a set of independent subsets of a graph and division of the model into a prescribed or arbitrary number of minimally connected subgraphs; 3) providing the developer with the obtained solutions for selecting a division variant satisfying a meaningful statement of the problem. The method realized by the package is based on methods constructed on the pattern of the method of branches and boundaries and on the realization of the method of successive calculations for searching the extremum of a submodular function. Program volume -- 1400 operators. Computation time of the control example -- six minutes.

Glukhivskiy, L. I.

SOFTWARE FOR DIFFERENTIAL HARMONIC METHOD. PACKAGE OF GENERAL-PURPOSE PROCEDURES (YeS 1060, FORTRAN-IV, OS YeS, version 4.1) -- Polytechnical Institute, Lvov, 1982, 245 pages -- Identification No 6023.

A package of procedures is given for use in programs developed for the purpose of determining periodic solutions of nonlinear differential equations (NDU) by the differential harmonic method (DGM). The package consists of 25 procedures and five test problems. Twenty-two procedures perform all basic operations of the method: computation of matrices of harmonic transformation, mutual transformations of amplitude vectors and nodal vectors, calculation of matrices of differencial harmonic parameters (MDGP) and multiplication of differentiation matrices by the amplitude vector or MDGP. Three procedures of the package realize various algorithms for solving nonlinear systems of finite equations which are harmonic representations of the initial NDU. The test problems cover all procedures of the package and are examples of the determination of periodic solutions of various NDU with the aid of DGM and the package. The length of all procedures of the package -- 502 operators. Computation time of the test problems -- from 0.96 (test 2) to 8.99 seconds (test 4). The package does not have analogs.

Sirodzha, I. B., Krylov, Ye. M., Diskant, V. A., Fursa, V. I. and Yeremina, L. A.

PACKAGE OF APPLIED PROGRAMS KOD-2 (YeS1033, FORTRAN-IV, PL-1, OS YeS, version 4.1) -- Aviation Institute, Kharkov, 1982, 343 pages -- Identification No 6029.

The package is intended for effective construction of structural and analytical rules for classifying objects by empirical data with characteristics of different type in problems of expert evaluation and recognition of objects with learning and self-learning. It can be used by scientific research organizations, industrial enterprises and computer centers for effective determination of rules for decision-making in problems of ASUTP [automated control systems for technological processes] and SAPR [automated design systems], analysis of expert evaluations, technical and medical diagnostics. The basic functioning mode of the program is the package mode. Program volume -- 10,000 operators. Computation time of the control example -- 2-3 minutes.

Ivanenko, V. I., Kolesnik, V. V., Barzilovich, Yu. V, Levkov, S. P. and Patiokha, A. A.

PACKAGE OF APPLIED PROGRAMS "Analysis of Systems of Ordinary Linear Differential Equations" (ALS-1) (BESM-6, FORTRAN-IV, DISPAK) -- Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, Kiev, 1980, 88 pages -- Identification No 6083.

This package is intended for solving basic problems occurring in studying objects of control whose mathematical description has the form of a system of ordinary linear differential equations with constant coefficients. It makes it possible to solve the following problems: finding a characteristic polynomial of the system and its roots; finding constant coefficients in the expression for a given element of the fundamental matrix of solutions; calculation of the response of the system to a perturbing function; finding transfer functions; expansion of determinants; solution of matrix equations; finding the greatest common divisor of two polynomials. The novelty of this package is the use of the Laplace transform system for solving basic problems. The package is constructed according to the modular principle and contains eight subprograms. Package volume -- 503 operators. Computation time of a control example -- one minute.

Mikhalevich, V. S., Shor, N. Z., Sergiyenko, I. V., Trubin, D. A., Zhurbenko, N. G., Lebedeva, T. T., Stukalo, A. S., Karpinka, Ye. S., Artemenko, V. I., Podgorodetskaya, I. S., Gershovich, V. I., Chumakova, B. M., Aimbetov, N. K., Babich, V. P., Belyaeva, L. V., Boyarchuk, D. A., Bushnyy, A. G., Gilburd, M. M., Godonoga, A. F., Kuntsevich, A. V., Priyatel, A. M. and Borshchevskiy, A. V.

PACKAGE OF APPLIED PROGRAMS FOR SOLVING OPTIMIZATION PROBLEMS OF LARGE-SCALE PRODUCTION AND TRANSPORTATION TYPE (PPP "Planer") (YeS1022, ASSEMBLER, FORTRAN-IV, PL-1, OS YeS, versions 4.1 and 6.1) -- Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, Kiev, 1983, 554 pages -- identification No 6141.

PPP [package of applied programs] "Planer" is intended for a wide range of problems of production and transportation planning of special classes. The package realizes the methods of solving problems of the transportation and distribution types, problems of the distribution of industries and their generalizations belonging to the classes of problems of linear, convex and integer programming. The PPP methods and algorithms were developed in the Institute of Cybernetics of the Ukrainian SSR Academy of Sciences and TsEMI [Central Economic Mathematics Institute] of the USSR Academy of Sciences on the basis of the achievements in the theory of mathematical programming in the area of the methods of nonsmooth optimization and the theory of constructing evaluations in discrete programming. PPP has an input control language and consists of an executive program and a data base which includes tables and applied modules. The library of functional modules of the package contains 19 applied programs. The total volume of the package software is 800 K bytes (55,000 operators). PPP operates in the batch and dialogue modes. The minimum volume of its main memory required for the operation of the package is 300 K bytes. The maximum computation time of the control example is three minutes.

Vasilyev, V. Ye. and Galchenko, V. V.

COMPLEX OF PROGRAMS FOR SOLVING SYSTEMS OF HIGH-ORDER LINEAR ALGEBRAIC EQUATIONS WITH A COMPLETELY FILLED MATRIX AND MANY RIGHT MEMBERS (YeS1022, PL-1, OS YeS, version 4.1) -- Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, Kiev, 1982, 63 pages -- Identification No 6149.

This complex of programs is intended for solving systems of linear algebraic equations (SLAU) with a completely filled high-order matrix. Its application area is: solution of SLAU with real and complex coefficients for many right members. Structurally, the complex consists of programs for solving SLAU with real and complex coefficients, access and multiplication of matrices with subtraction. A cellular modification of the method of optimal elimination of SLAU solutions is used in the complex. Its novelty is in the development of an algorithm and programs for solving high-order SLAU with many right members effectively working with an MD [magnetic disk] external memory and main memory of YeS [Unified System] computers. The complex of programs is oriented toward batch processing. The required volume of its main memory is not over 25 K bytes of static memory. The volume of additional dynamic memory depends on the order of SLAU and the number of right members. In the control example, the dynamic memory occupies 2540 bytes. Program volume -- 489 operators. The computation time of the control example on YeS1060 is 62 seconds.

Artyushenko, M. V., Petrov, O. P. and Staryy, V. V.

PACKAGE OF APPLIED PROGRAMS FOR PROCESSING TABULARLY GIVEN FUNCTIONS OF ONE OR TWO VARIABLES (SPLINE) (YeS 1033, PL-1, OS YeS, version 4.1) -- Institute of Cybernetics of the Ukrainian SSR Academy of Sciences, Kiev, 1981, 147 pages -- Identification No 6153.

The package serves for processing experimental results represented in the form of tables of one or two variables. It makes it possible to perform approximation with the aid of cubic and bicubic spline-functions, calculate the values

of functions and their derivatives at a given point or a point interval, to obtain graphs of approximated functions and to assemble a program aggregate of the required modular configuration. An input language was developed to make the work with the package convenient. Package volume -- 5000 operators, package computation time -- 13 minutes.

Bondarenko, M. F. and Sigalov, V. L.

COMPLEX OF PROGRAMS FOR SOLVING LOGIC EQUATIONS (YeS1022, PL-1, OS YeS, version 4.1) -- Institute of Radioelectronics, Kharkov, 1983, 191 pages -- Identification No 6187.

This complex of programs is intended for obtaining a set of data in the form of a root tree of logic equations of the algebra of finite predicates. The data set can be optimized in the process of its reception. The complex contains a program for searching for solutions of logic equations by the obtained data set. The application areas of the programs of this complex are any formally logical systems, such as logical models of language processes. The main functions of the programs of the complex are the normalization and factorization of logic equations. The novelty of this work is the originality of the method of solving equations and the algorithms used. The volume of the complex of the programs is 3600 operators. The volume of the main memory of the control example is 300 K bytes, computation time -- 11 minutes

10233
CSO: 1863/345

UDC 519.5

CONSTRUCTION OF COMPILER FOR MULTIPROCESSOR COMPUTING SYSTEMS

Kiev KIBERNETIKA in Russian No 6, Nov-Dec 84 (manuscript received 26 Mar 82) pp 18-22

BABICHEV, A. V., LEBEDEV, V. G., PARCHENTSEV, V. V., PRONINA, V. A. and TRAKHTENGERTS, E. A.

[Abstract] A compiler for multiprocessor computer systems is described that implements parallelization by combining individual stages of compilation, combining the translation of parts of a single operator (vector analysis methods), combining local transformations, and generating code for different sections of the program in an intermediate language. A parallel syntactic analysis method is described which is a modification of the LR(k)-method, and is implemented with the help of vector operation. The method requires no transformation of the initial grammars, and is easily implemented for a broad class of languages. The methods serve as the basis for a FORTRAN-77 compiler with enhanced parallel facilities for the PS-3000 multiprocessor system. Figures 4, references 8: 3 Russian, 5 Western.
[195-6900]

UDC 519.712.3

SEARCH FOR INVARIANT LINEAR RELATIONSHIPS IN PROGRAMS

Kiev KIBERNETIKA in Russian No 6, Nov-Dec 84 (manuscript received 3 July 83) pp 23-28

KRIVOY, S. A. and RAKSHA, S. G.

[Abstract] The automatic generation of invariant relationships such as linear equalities and inequalities is investigated. A solution is presented for the problem of intersection of two sets of linear inequalities. Methods are examined for generating invariant relationships, and are compared from the viewpoint of the power of the resulting sets of invariants. So-called MOP-problems ("meet over all paths") are discussed. Figures 1, references 10: 8 Russian, 2 Western.
[195-6900]

UDC: 681.3.06

DIALOGUE HIGH LEVEL LANGUAGE PROGRAM DEBUGGER

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84
(manuscript received 20 Dec 83; after revision 28 Mar 84) pp 70-74

PARNYUK, O. A. and TESLENKO, A. K. (Kiev)

[Abstract] A description of the UNIDEB debugger is presented. The operating principle of UNIDEB is based on the use of data on the absolute addresses of variables and program operators. These data can be obtained from interpreter or compiler listing files. However, it is best to place special debugging sections in the composition of object modules, such as sections containing the names, addresses and possibly characteristics of variables, including their type and length in bytes, as well as sections containing initial addresses of program operators. Formation of these debugging sections by compilers is not difficult in principle. UNIDEB is implemented as two files, the first containing the initial debugging phase, the second containing a movable object module for the main phase, to allow debugging of programs which later utilize the same address space temporarily occupied by the debugger. The instructions provided by UNIDEB are listed. UNIDEB is a utility available in the K1-DOS for the 'Elektronika K1-10' computer. Programs of up to 30 K bytes written in PL-M or FORTRAN can be debugged with UNIDEB. UNIDEB supplements the debugger for KRS80IK80 assembly programs based on the Elektronika K1-10 and MOS-2 monitor. References 3 Russian.
[151-6508]

UDC: 681.3.06

IMPLEMENTATION OF AN ADA COMPILER FOR SPECIALIZED DIGITAL COMPUTERS

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84
(manuscript received 7 Dec 83; after revision 31 May 84) pp 81-84

AYZENBERG, Ya. Ye. and BORZENKO, A. G. (Khar'kov)

[Abstract] A two-pass ADA compiler is described, in which the first pass converts the ADA source code to Assembler source code, while the second pass assembles the Assembler source code. Some of the features of the compiler are discussed and illustrated with brief ADA statements.[1] The use of the method of classification of ADA program fragments, methods of technological support for the SORT DBMS tool and near interactive debugging have allowed the development of an ADA compiler and its independent testing within one year by four systems programmers. A total of 10 man-years were expended. The compiler operates at an average speed of 3 - 5 ADA program lines per second on

1 The version of ADA here omits some operations.

a BESM-6 computer. More than 50% of compilation time is spent in the special Assembler, about 20% in the code optimization section. References 3 Russian (all translations of Enlgish works).
[151-6508]

UDC: 681.3

BASIC CONCEPTS AND ARCHITECTURE OF THE VIB-SM SOFTWARE SYSTEM

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84 (manuscript received 24 Oct 83) pp 91-95

KUPRIYANOV, V. P., RIPINITSER, V. Sh., SOROKIN, V. P. and SHARSHATKIN, Ye. P. (NPO Tsentroprogrammsistem, Kalinin)

[Abstract] A description is presented of the VIB-SM database software system, a modular software system with standardized interfaces among individual components. The system is intended to be functionally complete, supporting all categories of database users. Data are represented at three levels providing at the conceptual level an independent view of the data as a single model of the object area, creating a strong basis for database design. A single metadata storage facility, an active data reference dictionary, is provided, allowing coordinated description of all data and provision of necessary metadata for various users. Data organization can be used at the internal level of various systems to allow flexibility in the selection of most effective data storage methods. Representation of data at the external level is natural and simple, in the form of flat tables corresponding to the relational model. Application programs are physically and logically independent of the data, allowing portability of application programs even when the data organization system is modified. The system represents an idealogically unified system of database administration software with standardized interfaces. At the lowest level the SETOR-SM DBMS, the BSP program, and the operating system's file system are used. The first version of VIB-SM runs under OS RV version ZO with at least 128 K memory. References 4: 3 Russian, 1 Western.
[151-6508]

UDC: 681.142

ONE APPROACH TO THE DESIGN OF DATA STORAGE STRUCTURES

Moscow PROGRAMMIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 7 Feb 83) pp 13-17

BILKUN, S. N.

[Abstract] An approach is suggested allowing easy design of arbitrary structures relating small numbers of primary concepts by various relationships. A slightly expanded system from a previous work is used as the language tool. The approach suggested allows determination of the storage structure in a manner similar to that used in ordinary languages to define macro operations. Examples of determination of the most frequently used physical structures illustrate how operations are to be performed on these structures. Construction of systems of tools based on the approaches suggested in the article will allow definition and accumulation of internal data storage structures as is now performed with macro operations. The same approach can be extended to abstract (logical) data structures as well. References 4 Russian.
[157-6508]

DC: 681.3.06

SOME FEATURES OF THE IMPLEMENTATION OF EMBEDDED CONDITIONAL OPERATORS FOR MULTIPROCESSOR COMPUTER SYSTEMS WITH COMMON INSTRUCTION FLOW

Moscow PROGRAMMIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 18 Apr 83; revised form 21 Oct 83) pp 37-47

BILENKIN, S. Ya., VOROB'YEV, G. G. and LIFSHITS, V. N.

[Abstract] A study is made of the syntactic and semantic characteristics of embedded conditional operators for multiprocessor computer systems with a common instruction flow, as well as the possibility of combining monotypical operators in independent branches. The purpose of the work is to develop recommendations for implementation of language structures in this environment, to provide a basis for the use of the flow of conditions and to derive sufficient conditions for optimization of programs for multiprocessor computer systems with common flow of instructions. The syntax and semantics of the basic types of conditional operators such as the if-then-else structure are outlined. Construction of conditions in multilevel if operators is demonstrated. Sufficient conditions are derived for combination of multilevel if operators. References 7: 4 Russian, 3 Western.
[157-6508]

UDC: 681.3.06

ONE PROBLEM OF DESIGNING THE LOGIC STRUCTURE OF A UNIFIED DATABASE

Moscow PROGRAMMIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 31 May 83) pp 77-81

KUKHARENKO, B. G. and CHIRONOV, V. V.

[Abstract] A study is made of the problem of designing the logical structure of a unified database for use in an integrated automated information system. In order to implement the process of coordinating the local representations of the object area of the integrated information system, all of these local representations must be formulated in terms of a certain unified data model. The principles of the analysis used in this article are based on the relational data model. Noncontradictory conditions for individual representations and full representation of the object area are derived. In practice, the creation of an automated information system based on combination of local relational models always involves a certain area of intersection of the models leading to common nonlogical symbols in the formal data models. References 10: 7 Russian, 3 Western.
[157-6508]

UDC: 681.3.015

CONSTRUCTION OF A PROGRAM-TUNED SUBSYSTEM FOR AUTOMATION OF THE PREPARATION OF CONTROL SYSTEMS IN ARM-R/SM-3

Moscow PROGRAMMIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 29 Dec 81; after revision, 12 Aug 83) pp 87-89

BALMACHEYEV, V. V., BUDNIK, I. V. and NIKOLAYEV, O. A.

[Abstract] The ARM-R/SM-3 is an automated developers workstation developed for the SM-3 computer. The developed program-tuned subsystem is invariant with respect to the system of instructions of the program controlled equipment and allows reduction in the time and improvement of the quality of programming. The design of the program-tuned subsystem for automated preparation of control programs for program-controlled equipment on the basis of the apparatus of microprocessor using this workstation is described. The system allows generation of FORTRAN-IV post processors which convert information from the standard CLDATA language to program-controlled equipment commands. The operation of the program-tuned system is analyzed in some detail. The development of the post processor is reduced to writing a program in the CLDATA input language, supplemented if necessary with a macro library for the specific program-controlled equipment used. References 2 Russian.
[157-6508]

UDC: 681.3.06

CONSTRUCTION OF AN ASSEMBLER TYPE PROGRAM CONTROL GRAPH

Moscow PROGRAMMIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 26 Apr 82) pp 90-91

KATKOV, V. L. and IVANCHENKOVA, N. G.

[Abstract] The control graph of a program consists of those nodes which represent the linear portions of the program and connecting arcs among nodes in accordance with the transfers of control. A knowledge of the control graph is useful for the construction of economical testing plan, production of necessary sets of initial data for testing and determination of incorrectness in the program. This article describes an algorithm for construction of a control graph of a program written in an Assembler type language for which it is easy to determine the agreement of the machine code with the initial text control instructions. References 3: 2 Russian, 1 Western.
[157-6508]

UDC: 681.323:629.7:371.69

PRINCIPLES OF THE SILHOUETTE METHOD OF IMAGE SYNTHESIS

Kiev ELEKTRONNOYE MODELIROVANIYE in Russian No 4, July-Aug 84 (manuscript received 8 Apr 82; after revision, 24 Sep 82) pp 14-17, 71

DUCHENKO, N. N. and TIMOSHENKO, N. P.

[Abstract] One of the major stages in development of computer graphics is removal of hidden surfaces and lines, a problem widely discussed in the literature. Nine algorithms commonly used can be broken down into two approaches: object and perspective types. The Watkins algorithm, considered the most successful, is briefly described. An improvement of the Watkins algorithm is suggested, the silhouette method. The operation of the algorithm occurs in two stages: processing of base circle and formation of a projected silhouette of an object. Each of these processes is described. The formation of a silhouette is achieved by transition from a set of data consisting of a pair of circles and their mutual placement to satisfaction of a set of rules. The effectiveness of the method is estimated. References 11: 2 Russian, 9 Western.
[165-6508]

UDC 681.7.014.3

AUTOMATED IMAGE PROCESSING (4. SYSTEM FOR PROCESSING IMAGES OF MICROSTRUCTURES)

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR, SERIYA B: KHIMIYA, TEKHNIKA, FIZICHESKAYA GEOGRAVIYA, No 1, Jan-Feb 85 (manuscript received 5 Jan 84) pp 89-93

VAL'TERIS, S. E., GUL'BINAS, R. Yu. and POVILAYTIS, R. K. (Institute of Physical and Technical Power Engineering Problems, Latvian SSR Academy of Sciences)

[Abstract] A system is described for automated processing of structural images represented in the form of binary (two-level) images. The fact that the set of structural images can be reduced to binary form makes it possible to simplify the hardware, to reduce the computing resources needed, and to speed image processing. An automated system for processing binary images designed for automatic structural investigations of refractory ceramics is described. Experience in the use of the system indicates that the approach can be used in other areas of science, e.g., for processing the tree structures encountered in aerial photography, research on the human circulatory system, etc. Figures 2, references: 8 Russian.
[341-6900]

UDC 621.391.19:620.18

AUTOMATED IMAGE PROCESSING (5. IMPROVEMENT OF BINARY IMAGES OF REAL STRUCTURES)

Vilnius TRUDY AKADEMII NAUK LITOVSKOY SSR, SERIYA B: KHIMIYA, TEKHNIKA, FIZICHESKAYA GEOGRAVIYA, No 1, Jan-Feb 84 pp 95-99

VAL'TERIS, S. E. and VITKUTE, V. V.

[Abstract] Automated analysis of binary images of real structures is analyzed. It is shown, through the example of structural analysis of refractory ceramic material, that fine structural elements and the boundaries between the ceramic brains are factors that hinder the identification of the areas and the distribution of the geometric dimensions of voids. A compression method is proposed that can be used to isolate interpreted objects from a background that exhibits a network structure. Figures 5, references 5: 4 Russian, 1 Western.
[341-6900]

UDC 681.3.06: [550.83:553.3]

USE OF HIGH-THROUGHPUT PS-2000 EGVK SYSTEMS IN SOLVING MINING GEOPHYSICS PROBLEMS

Moscow RAZVEDKA I OKHRANA NEDR in Russian No 5, May 85 pp 45-49

[Article by V.K. Ivanov, A.F. Fokin, A.M. Tseloval'nikov and V.N. Yakovlev, Rudgeofizika [Mining Geophysics] NPO [Scientific Production Association]]

[Text] The PS-2000 EGVK [Electronic Geophysical Computer Complex] computing system has been in service at the VIRG [All-Union Institute of Mining Geophysics] Rudgeofizika NPO since 1983 for purposes of solving problems in the area of processing and interpreting mining geophysics data. It is in the form of a multiprocessor computing system operating under control of a monitor subsystem based on an SM-2 minicomputer, in relation to which the multiprocessor, external storage subsystem and input/output units act as peripheral devices. The computing system serves a crew of two electronic engineers, a mechanical engineer and a systems programmer. This personnel structure makes possible a single-shift operating mode with annual utilization on the order of 1750 hours, 48 percent of which is spent on the introduction and use of seismic prospecting software, and 52 percent on the development and use of software for non-seismic methods of geophysics.

The use of computer technology at head scientific research institutes, which include the VIRG, differs considerably from the goals and objectives of its use in production organizations of the USSR Mingeo [Ministry of Geology]. Whereas in geological production associations principally the mass processing of seismic data is performed according to standard processing graphs with the basic SOS PS [expansion unknown] processing system, at VIRG the principal utilization of the computer is for the development of problem software for non-seismic methods of geophysics, and in the field of seismic prospecting, for the development of new procedures for processing seismic data in mining regions, and for processing the data of physical modeling of complex-structure media (advantageously, based on the SOS PS). VIRG was one of the first to introduce the starting package of programs of the SOS PS and to test a number of subsequent versions of this system, but the processing of mining seismic prospecting data according to standard graphs plays a subordinate role at the Rudgeofizika NPO. The principal amount of processing is performed on a YeS-1033 computer with the STsS-3 system. Provision has been made for communication of the SOS PS and STsS-3 systems at the information level. In particular, graphic output on an electrostatic plotter and demultiplexing procedures are performed in the

EGVK regardless of which system is used at other stages of processing. In processing the production data of an experimental procedure expedition, the SOS PS is usually used in one of the sections in the multisection operating mode of the EGVK; because of this, groups of programmer developers of mining geophysics software have parallel access to the resources of the computing system.

The development of problem software for mining geophysics for the EGVK is proceeding at the present time in several directions. The first package of programs has been developed for processing the results of gravitational magnetometric prospecting (primal problems in the interpretation and transformation of potential fields), and a package of modules for the non-standard classification of a set of features. Part of the procedures used in these programs are intended for access to the multiprocessor. An engineering assignment has been developed and work has begun on the development of an ASOD [automated data processing system] for combined aerogeophysical surveys with a station of the SKAT [expansion unknown] type, including a broad-purpose data base management system. Finally, important experience has been gained in transferring to the EGVK packages of application programs of the data processing system for mining geophysics intended for a YeS [Unified Series] computer (components of the ASOM RG [expansion unknown] system). This software at the present time includes an interactive system for the interpretation of VEZ [vertical electrical logging] for the case of a horizontally stratified medium and a number of other problems in geophysical prospecting by electrical means utilizing direct and alternating current, some inverse problems in the interpretation of potential fields, etc. Although the multiprocessor is not used in this case, nevertheless the modular principle of the software's design makes it possible to solve this problem with time, at least for some tasks.

The development of a set of problem software acutely raises the question of the organization of the graphic output of the results of processing the data of various methods of mining geophysics. Practically speaking, the SOS PS at the present time offers only the graphic output of seismic lines onto a plotter of the raster type. In this connection, considerable attention is being paid to the development of software for various kinds of representation by means of the electrostatic plotter included in the standard EGVK set. The following have been implemented in the form of programs at the present time: the representation of VEZ graphs in a log-log grid, used for outputing the results of interpreting electrical logging; graphs from the logging of wells and cores through wells; maps of strip graphs with the orientation of axes along the direction of advance of the paper tape; isometric projections of an image of geophysical fields; and charts of isolines in symbolic form. The output of the data of transformations of potential fields, implemented in the EGVK in the form of charts of isolines, is performed after the appropriate recoding of files on the ATLAS-4 plotter, using the set of programs for constructing charts of isolines for YeS computers.

Questions relating to the preparation, checking and input of geophysical information, characterized by a diversity of forms of gathering and storage and, for methods such as electrical logging and gravitational magnetometric prospecting, by the predominance of the journal method of recording, have not been

solved for the standard EGVK. An alphanumeric display, units of the YeS-9004 type (preparation of data on YeS magnetic tape) or punched cards are used directly at the present time.

The processing of mining geophysics data differs substantially from the processing of seismic data. A diversity of parameters and structures is typical of the data themselves, the analytical base of the processing of methods is considerably more complex, and many interpretation tasks are incorrect, which necessitates the adjustment of programs in terms of parameters. In this connection, efforts for optimizing the software for non-seismic methods for the purpose of achieving maximum throughput, so obvious in the SOS PS, are not always feasible for other geophysical methods.

In our opinion, two directions for the utilization of the PS-2000 are possible in mining geophysics. The first relates to the parallelizing of algorithms and leads not only to a new form of programming, but also to the complete revision of the algorithms themselves. At the same time, the majority of them are based on standard mathematical methods, and, as studies have demonstrated, achievements in the area of their parallel implementation have turned out to be more modest than anticipated.* The second direction is the parallel processing of various data (e.g., data on parallel observation lines) according to the traditional program. The cost of the parallel implementation of these algorithms is considerably lower and the significance of these tasks in mining geophysics is very great.

Let us take as an example the typical inverse problem of the interpretation of potential fields. Its mathematical formulation reduces to minimizing a functional representing a measure of the discrepancy between the theoretical and experimental fields and depending on the parameters of the medium and the observation system. With respect to the latter, the algorithm is as a rule regular in the sense of parallel implementation at the stage of reiterated solution of the primal problem. Minimization of the functional by iteration methods requires high computing input, which can be reduced on account of parallel computation of the functional at each iteration step. With this, the acceleration factor is close to the maximum possible and equals the number of processor elements in the specific EGVK configuration. If the primal problem does not permit an analytical solution, then the inverse problem can be formulated as an optimal control problem, which reduces to the integration of sets of differential equations in terms of the vector parameter and also permits effective parallel implementation. Inverse problems are characterized by a small amount of input data, but by a considerable amount of computations; therefore, the problem of organizing data for them is not as important as in problems of mass uniform processing (e.g., the data of a digital seismic station). In this case, the problem of the interchange of information between input/output units and the memory of the multiprocessor's solving region comes

*Yershov, A.P., general editor. "Algoritmy, matematicheskoye obespecheniye i arkhitektura mnogoprotsessornykh vychislitel'nykh sistem" [Algorithms, Software and Architecture of Multiprocessor Computing Systems], Moscow, Nauka, 1982.

to the forefront. The system's throughput will be determined principally by the input/output throughput and the structurization of the data.

If the SOS PS package is not taken into account, application software for the multiprocessor has been lacking up to the present time in EGVK's supplied. This relates to elementary and transcendental functions of the vector argument, not to speak of matrix algebra subroutines. Such software does not have expressed problem specifics and is usually included in the standard set of general software for the computer.

The tasks facing head scientific research institutes of the USSR Mingeo, with respect to the utilization of EGVK's, consist primarily in the development of application software designed for the implementation of the capabilities offered by the multiprocessor. The absence of elementary facilities for automating programming is forcing application software developers to devote a great part of their time to coding microprograms, and not to the algorithmic essence of tasks. A programming system based on the VECTOR language, developed at IPU [Institute of Control Problems] (first version), was adopted and tested at VIRG. The system includes a compiler, a PS program debugger, a generator, a BSP [library of standard subroutines], and SM-PS interchange routines. In the process of experimental testing of the system, a number of important shortcomings were discovered which impede its practical utilization in the development of software for mining geophysics, in any case, in the first version. The VECTOR language, although it eliminates part of the difficulties associated with algorithmization, nevertheless does not solve the problem as a whole. Enhanced-accuracy facilities for processing data are lacking in it, the interchange of data is performed not by language facilities, and the object code produced by the compiler is ineffective.

Serving as the basic programming language for the PS-2000 is a microcode, which, being a language for the symbolic coding of microprograms, represents a formalized description of the architecture of the multiprocessor. Programming in microcode requires knowledge of all the features of the architecture of the PS-2000 and is intended not for applied geophysicists, but for professional programmers. However, the principal difficulty does not consist in this. The EGVK microprocessor acts as a peripheral device with respect to the SM-2 UVK [control computer system], which organizes the computing process. There are facilities for organizing the computing process in the EGVK software, but the level of automation is exceedingly low. Therefore, the job of geophysicist programmers is complicated, covering the area of planning the resources of the multiprocessor and the interchange of data. The decentralization of developments covering these areas necessarily leads to ruinous consequences, which have an effect on the quality and mobility of the software developed. The organizations developing the PS-2000 EGVK did not pay the necessary attention to these questions.

Encountering in practice the lack of the necessary level of automation of programming, developers of software for mining geophysics at the Rudgeofizika NPO were forced to make an attempt to develop a minimum set of programming facilities for the PS-2000, not designed for the complete cycle of the development of subsystems for processing geophysical data. The goal

set was not the maximum utilization of the resources of the multiprocessor for the purpose of achieving ultrahigh throughput, but reduction of the factor of the manual labor spent on the development of problem software.

The facilities developed include the following: a language of the assembler type; an input language compiler, which prepares a program suitable for execution in the PPS (the N-program); a dynamic loader for the N-program; and debugging facilities. The general development idea reflects the conception of the macrolevel of programming for the multiprocessor. The loader plans the resources of the PPS, controls the loading of N-programs, implements communication between the MMS [expansion unknown] program and the N-program via the formal parameters device, and implements facilities for asynchronous interchange of data. The input/output unit has facilities for synchronizing parallel processes in the monitor subsystem (MPS) and the multiprocessor (PPS). In the first version, the compiler outputs an object program in the form of an N-file interpreted by means of a special resident microprogram. The interpretation mode lowers the total throughput of the multiprocessor to two million to three million operations per second, of the multiplication with a floating point type (in a configuration containing 32 processors). The facilities developed were oriented toward solving geophysical problems requiring great speed, whose algorithms do not contain branching for data.

The generation facilities of processing subsystems are oriented toward functionally complete libraries of problem routines designed as closed routine units of the SUB RUTIN [as published] type of the FORTRAN language, or in the form of an N-program for the PPS. Functional completeness is understood as related to a specific subject area (e.g., the interpretation of gravity anomalies), and implies the permissibility of expanding the (random) processing graph into a linear sequence for calling subroutines. The generation facilities make it possible to design in a short time from this functionally complete package a processing subsystem of the monitor type with an evolved job control language, which frees the user from programming in the traditional sense and makes it possible to access in a language intelligible to him any subroutine interactively, with the ability to modify its parameters. The default unit provided in the generation facilities can reduce to a minimum actions in working with the subsystem.

In conclusion, let us dwell on the prospects of using the PS-2000 EGVK in mining geophysics. One possible direction for the use of an EGVK is the development of interactive systems for processing and interpreting geophysical data. The solution of problems with determinate algorithms involves considerable difficulties, e.g., with respect to formalizing a priori information, the impossibility of modeling the intuition of the interpreter, and the like. Terminal access to the computer in real time and the possibility of the graphic output of data aid the solution of interpretation problems in the interactive mode, converting the computer into an expander of the intellectual capabilities of a specialist interpreter. The furnishing of the EGVK with displays and the presence of a high-throughput multiprocessor permit its use for solving problems of this kind. Inverse problems in interpretation are easily formalized and can be implemented in the form of interactive systems which are open with respect to the class of primal problems. The development of these

systems must take into account the specifics of concrete subject areas by the development of subject-oriented languages understood by specialists of a given field. The facilities for generating processing subsystems developed at VIRG represent a practical beginning in this respect for mining geophysics. Able to serve as an example of a similar language is the SOS PS geophysical job language, although it is oriented toward batch processing and the compiler for it uses a compiling system which is not suitable for interactive operation in real time.

The principal difficulties in developing problem software for mining geophysics for the PS-2000 are associated with the insufficient accuracy of computations (four to five decimal places) as a result of the short word length, and with the lack of advanced general-mathematics software for the PS-2000 EGVK which could be used by programmers directly and sufficiently easily, as well as of a uniform standard for organizing an interface between the computing medium of the SM-2 monitor system and the computing system's multiprocessor.

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EXPERIENCE IN OPERATING YeS-1045 COMPUTER AT COMPUTER CENTER OF ALL-UNION SCIENTIFIC RESEARCH INSTITUTE OF RAILROAD TRANSPORTATION

Moscow AVTOMATIKA,TELEMEKHANIKA I SVYAZ' in Russian No 4, Apr 85]

[Article by A. D. Chebotarev, division chief of the Computer Center of the All-Union Scientific Research Institute of Railroad Transportation, I. V. Safonkin, division deputy chief, S. V. Fedulov, M. P. Kalugin and A. M. Karachinskiy, senior engineers]

[Text] The YeS-1045 computer is a computer of the third generation of the second stage ("Ryad-2") of the unified system of electronic computers (YeS EVM). Computers of this section differ from "Ryad-1" computers by their improved technical, economic and operational characteristics, which makes it possible to substantially expand their application area due to the introduction of new means and potentialies. These characteristics include:

dynamic address conversion (DPA) which is performed by a processor in combination with appropriate programs within the limits of the operating system and can be used for simulating the main memory of a larger size than the actual main memory of a given computing unit. This imaginary main memory is called virtual and is usually placed on external carriers (magnetic disk stores). The virtual memory apparatus makes it possible for the user to increase the addressed space of the computing device to 16 Mbytes;

indirect addressing of data in the channel intended for performing DPA in input-output operations. Indirect addressing makes it possible for one control word of the channel to organize data exchange with nonadjacent areas of the real main memory;

high-speed input-output channels. The YeS-1045 computer has two types of channels; 2 byte-multiplex channels (BTMK) which make it possible to operate in the byte-multiplex and monopole modes and 4 block-multiplex channels (BLMK) with the possibility of working in the block-multiplex and selection modes. The input-output channels of the computer have a combined control; hardware-microprogram. Data exchange through the input-output interface is performed under the control of the channel hardware simultaneously with the operation of the processor. Data exchange between the input-output channels and the main memory (OP), as well as the processing of the control information, are performed by the equipment of the central processor (TsP) under the control of a microprogram;

a high-speed buffer memory BP and buffer instruction memory BPK. The buffer memory with a capacity of 8192 bytes (8K) is designed with integrated circuits, and the access time to the information is commensurable with the cycle length of the TsP. BP stores a 16-byte information unit after storage access of TsP to OP. Due to the used BP filling algorithm, the probability of finding the next operand in BP is approximately 85%, which reduces the average access time of the data used most frequently by the processor. BPK is a high-speed memory using integrated microcircuits with a capacity of 32 eight-byte words and is intended for storing 64 instruction words. Due to the presence of the buffer instruction memory, the effectiveness of the instruction selection process increases noticeably because the selection of instructions from BPK or OP is combined with the execution of instructions in the processor;

an accelerator intended for accelerated performance of 30 arithmetical and logical operations of the types of multiplication, shift, packing, unpacking, etc. The presence of the accelerator increases the efficiency of the processor by an average of 15...17% with an increase in the amount of equipment by 5...6%;

expanded set of instructions. The instruction system of the "Ryad-2" computer has been expanded substantially in comparison with the instruction system of the "Ryad-1" computer;

means of repeated performance of instructions which help in continuing or restoring a computation process when a malfunction occurs. This is accomplished by equipment-microprogram repetition of any of the instructions of the processor or input-output during the performance of which an error occurred. If the instruction rerun is successful, the disrupted work continues and the interruption conditions are recorded for further analysis. Otherwise, the same operation is repeated (up to eight times). In the case of unsuccessful performance, the condition of the computer is recorded in the memory of the control panel and in OP, and the control circuit interrupts the operation;

means of microdiagnostics which make it possible to check the equipment of the main memory, the processor, the channels and BUP [memory control unit];

timing devices which include: interval timer; clock intended for indicating the date and the time of the day; a comparator causing interruption when the content of the clock reaches a programmed value; TsP timer;

equipment for recording program events intended for improving the effectiveness of the adjustment process;

automated system for monitoring and diagnosing power supply (ASKDE) which makes it possible to substantially reduce the laboriousness of fault searching in the power supply system of the computer.

The YeS-1045 computer has the following technical characteristics:

efficiency for scientific and technical problems -- 870,000 operations per second, for economic problems -- 550,000 operation per second;

TsP and channel control method -- equipment-microprogram with a length of the computer cycle of 120 ns;

computer control memory (UP) intended for storing microinstructions consists of permanent UP (UPP) and loaded UP (UPZ);

the main memory of YeS-3206 has an information capacity of 1024 Kbytes, length of the data file selected during one reference 16 bytes, access time less than 650 ns;

six input-output channels: 2 byte-multiplex (BTMK) and four block-multiplex (BLMK);

the channel capacity of each BTMK in the multiplex mode is 40 kbyte/s, in the monopole mode -- up to 120 Kbyte/s, and the channel capacity of BLMK without consideration of the chain of data depending on the number of the channel is 0.5...1.5 Mbyte/s. The total capacity of all six input-output channels is up to 5 Mbyte/s;

the universal set of instructions of YeS computers is 183 instructions;

the element base of YeS-1045 computers consists of integrated logic circuits of the 500 series designed on the basis of the emitter-coupler transistor logic and constructed with the use of current switches. The delay time of one gate is 1.5...2.0 ns, and the gate power consumption is 25 mW;

the base of TEZ [standard replacement elements] is a ten-layer printed board manufactured by the method of metalization of through holes with the possibility of placing up to 60 IMS [integrated microcircuits] on one TEZ;

power consumption of the computer is 50 kV·A.

The main computer set requires a room with an area of not less than 135 m^2 in which the following climatic conditions must be maintained: temperature (20±2) ^{o}C, humidity (65±15)%, pressure 630...800 mm Hg.

In the computer center of the VNIIZhT [All-Union Scientific Research Institute of Railroad Transportation], the YeS-1045 computer is operated with the operating system OS YeS in the SVS mode. The generation of OS SVS is done according to the new version of the operating system which has the code Ts51.804.006-1 (version 6.1, release 01).

The OS SVS has expanded possibilities of increasing the effectiveness of the operating system, as well as new facilities based on the use of virtual memory: automatic priority grouping (APG) ensuring effective utilization of the central processor by problems of various degrees of input-output intensity; virtual access method (VSAM) is a new access method which uses the special characteristics of computers of the "Ryad-2" series and is independent, the format of the data sets maintained by VSAM does not depend on the type of external carriers. The transmission of data and their search on external carriers is considerably more effective with the use of this method.

OS SVS maintains the time sharing mode RRV, which makes it possible to use it simultaneously by several programmers. The access to RRV is organized through YeS-7920 displays and subscriber's stations AP-64 (AP-64) located in rooms far removed from YeS-1045. The user working at the terminal has access to all computer resources without feeling the presence of other users. The time sharing mode is convenient for debugging programs because it makes it possible to obtain results on the AP screen, to translate and execute programs in one's own section and, which is most important, to perform dialogue debugging of programs.

When checking the operational readiness of the computer, as well as searching for defects, the following devices are used: a microdiagnostics set, a maintenance program set (KPTO), an on-line test set (KNTU) and a complex automated testing set (SKAT).

Microdiagnostics includes a sequence of test microprograms and a set of equipment intended for the localization of faults in the central processor, memory control unit, channels, "channel-channel adapter" and YeS-1045 memory. It uses a minimal part of the operating equipment of the central devices of the computer. For complete checking of all assemblies, the tests are performed in sequence from the beginning, because the performance of each following test presupposes successful completion of the preceding test.

Checking of the equipment and various types of memory is done by comparing the performance results of microoperations with standard data. If the data do not correspond, an error is registered and the test is stopped. By the location of the stop in the microdiagnostic print-out, the TEZ are identified in which there could be faults. The tests are recorded on cassettes and are started from the control board storage unit.

Microdiagnostics makes it possible to detect static errors (failure of integrated microcircuits, breakage of wires, shorting of wires, absence of contact in connectors, etc), but cannot always detect dyanimic failures (changes in the time delays of microcircuits, appearance of parasitic capacitance, etc).

Upon successful completion of microdiagnostics, the KPTO set is loaded. With its aid it is possible to localize faults in central devices which were not detected by microdiagnostics, as well as faults in external memory devices (NML [magnetic tape storage], NMD [magnetic disk storage]) and peripheral devices (ATsPU [alphanumeric printer], PM [instrument bus], punched-card, punched-tape input-output devices, and others).

The KNTU set controlled by the operating system makes it possible, without disturbing the computing process, to check individual devices of the YeS-1045 computer. It is convenient to perform such testing for devices having a "hot" reserve.

The Computer Center of the VNIIZhT is testing a complex automated testing system (SKAT) intended for complex checking of all computer devices in the state of readiness. SKAT tests simultaneously all of the devices and with a period of three minutes produces a reliability record. It shows the number of test units performed for each device and the number of units with errors.

If malfunctions are detected in the realibility record, the isolation mode is prescribed which gives a more detailed information about the errors. As a result of this it is possible to have a detailed analysis of the situation and, if necessary, it is possible to loop the unit with an error for studying with the aid of an oscillograph.

Thus, SKAT makes it possible in a short amount of time to determine the parameters of the computing system and helps in localizing and removing faults in the computer. It is possible to use SKAT in all models of YeS computers.

In the process of operation of the YeS-1045 computer, the Computer Center of VNIIZhT revealed its weakest points which have substantial effects on the operation of the system as a whole. One of them is the interchangeable magnetic disk storage (NMD) YeS-5066. When the operating system OS YeS operates in the SVS, OS YeS and SVM YeS modes, the frequency of references between the main memory and NMD increases substantially, which imposes higher requirements upon the operational reliability of these devices.

Faults in the YeS-5066 device during the run-in period occurred most frequently in the power supply system of the storage units (BP, BUP). They were caused by improper soldering, poor mechanical connection of the wires and absence of protection against starting current in the primary circuit. Moreover, the large mass of supply units (100 kg) makes it difficult to repair them efficiently.

For effective operation of NMD, it is necessary to organize an airtight zone in which an optimal level of dust content, temperature and moisture must be maintained according to TU (specifications). It is necessary to carry out regular preventive maintenance of storage devices consisting in inspection and cleaning of magnetic heads, guides of the positioning unit and course and fine filters.

It is a standard practice at the VNIIZhT Computer Center to thoroughly select packs of magnetic disks YeS-5266 (100Mbyte), which includes inspection of plates on a special unit, their cleaning from dust with isopropyl alcohol and preliminary initialization for determining the number of defective tracks (their maximum permissible number is 133).

In the display complex YeS-7920.01, microcircuits of the buffer memory K507RU1 and comparators K521SA1 sometimes failed to operate. This was caused by poor temperature conditions of the control bay YeS-7922 and displays YeS-7927.01. Additional fans were installed, which created normal operating conditions for the devices.

In the main memory YeS-3206, there were instances of failures of the memory modules YeS-3941. This occurred due to breakage of data and address buses and reading buses, breakage of printed circuits, shorting of printed circuits as a result of a poor quality of soldering, and failure of TEZ's of address-data drivers YeS-3941/0001.

The central devices of the YeS-1045 (the processor, channels, memory control unit) operate reliably. Faults in these devices are connected chiefly with the absence of contact in the TEZ's connectors and failures of microcircuits. It should be mentioned that integrated microcircuits of the 500 series failed

relatively seldom, which indicates their high quality. The intensity of failures increases at a temperature of 24...25°C and higher, which is connected with a higher density of mounting (up to 60 microcircuits on a TEZ) and high released power. Therefore, it is very important to maintain a constant temperature of (20± 2)°C in the machine room.

In conclusion, it should be mentioned that the wide technical potantialities, the developed systemwide software and sufficiently high reliability indexes of the YeS-1045 computer make it possible to ensure effective operation of the hardware and the entire complex of software of the automated railroad control system.

10233
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COMPUTER-AIDED DESIGN OF CONSTRUCTION

Frunze SOVETSKAYA KIRGIZIYA 28 May p 2

[Article by correspondent A. Freydzon "Computer Helps Designer"]

[Text] At a meeting of the CPSU Central Committee the subject was discussed of the need for more extensive automation of the work site of designers and for the introduction of advanced technology which could help them to more fully use their creative potential. The Kirgiz Industrial Design Institute (Kirgizpromproyekt) is one of the first in the republic to introduce computer technology for computer-aided preparation of cost estimates and other computations.

At the request of the editors,the chief engineer of the institute, R. Dzhundubayev, and the head specialist in the department of computer-aided design, V. Ivanikov, discuss the innovation.

"Our computer center together with a series of design organizations of the country are participating in the development of equipment for the design of industrial buildings based on the YeS-1033 third-generation computer. We were given problems concerning heat supply, ventilation and air conditioning, environmental protection and cost estimation. In addition, our computer center services are being used by nine design organizations of the republic, the polytechnic institute and the Kirgiztorgmash industrial association. This makes it possible to use the computer for all three shifts. In addition, we have the possibility of selecting the most optimal from the many computation variants.

"Nevertheless it must be admitted that the level of automation in our work is still only 12% in all. Our task is to double this indicator by the end of the 12th Five-Year Plan. It is also intended to markedly increase the work productivity of specialists who will be freed by the technology from monotonous labor-consuming operations. And naturally more time can be devoted to the solution of creative problems and the selection of more economical variants of designs."

"If cost estimates continued to be produced in the old way," added V. Ivannikov, "then for the present work volume we would have to triple the number of specialists in cost estimation. But our computer center prepares cost estimates for all the design organizations of the city. The use of the computer also makes it possible to speed up design, increase the precision of the computations and, of course, improve the quality of the design and cost estimate calculations.

"Experience with the design programming using a display complex installed at the Kirgiz Kolkhoz Design Institute (Kirgizkolkhozproyekt) and at our institute is

also interesting. It is already no longer necessary for our colleagues to waste time on trips to our institute. They can obtain information for each computation without leaving their buildings. The dialogue system for problem processing makes it possible for specialists to see on the screen at any time a display of results, to introduce additional material into the computations and to obtain printed copy when necessary. The link to the computer center is through the local telephone line.

"There are many other innovations in the designers' arsenal which make it possible to increase the creative potential of the engineers."

12497
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COMPUTER DESIGN OF TESTING AND AUTOMATION SYSTEMS

Moscow AVTOMATIZATSIYA I KONTROL'NO-IZMERITEL'NYYE PRIBORY V NEFTEPERERABATYVAYUSHCHEY I NEFTEKHIMICHESKOY PROMYSHLENNOSTI TEMATICHESKIY OBZOR in Russian (signed to press 14 Aug 84) pp 3-5

STEPANYAN, S. G.

[Abstract] The process of developing automated design system software can be divided into four stages: development of the problem solving method, problem solving algorithm, program for problem solution and programs corresponding to the requirements of design technology. The last two stages are frequently merged together, although it is often necessary to perform considerable additional effort to make a program technologically suitable for use in the automated design system. The testing and automatic regulation subsystem, representing some 10% of a total automation system, requires design of electrical control devices as well as automated information handling devices. Since computation problems represent only 2-4% of the total volume of the design for a testing and automatic regulation system, the remainder being logic and graphic problems, this subsystem must be considered difficult to automate.
[141-6508]

MICROPROCESSOR TECHNOLOGY IN TELEGRAPHY

Dushanbe KOMMUNIST TADZHIKISTANA 25 May p 2

[Article by S. Anikiyenko "Towards Technical Progress-The Electronic Telegrapher"]

[Text] At the Dushanbe telegraph-telephone station, test operation of the Telegraf hardware-software complex utilizing microprocessors is being carried out. The complex completely automates the reception and transmission of telegrams at the central telegraph office. The equipment was assembled by staff from Dushanbe in association with Kharkov specialists.

The introduction of the innovation made it possible for workers at the station to solve an entire set of problems. The hardware-software complex served by a single operator replaced a large team of workers. The speed of operation is 400 telegrams per hour.

The complex makes many demands on its own resources. When it receives a telegram from outside of the republic the computer directs one of its units to assign a code to it. The electronic telegrapher then directs the telegram to its destination. Five minutes are necessary for this operation. The complex makes four attempts to transmit the information to the addressee and considers its task completed only when it receives as a guarantee of execution an answer-back from the post office reception service. One of the computer units is assigned the task of recording all processing operations and times in a special register log.

Every hour, the hardware-software complex establishes an evaluation of its work and generates information on how many telegrams were processed and how quickly as well as the number of telegrams sent whose processing was slow. This type of computer self-accounting is also carried out at the end of the work shift.

The possibility of a stoppage of the complex is entirely excluded. If one computer block fails it is immediately replaced by another completely identical unit. The error in telegram processing is reduced to a minimum.

The workers of the telegraph-telephone station were committed to starting up the complex by Victory Day and were successful. The holiday served as an examination for the hardware-software complex. On days of this kind the station processes up to eight thousand telegrams. On these days there is also a large number of through-line items (telegrams without codes and those which, because of overloading of post office services arrive at the central telegraph office). During the days of the last holiday, the complex easily dealt with the traffic which was many times greater than usual.

The hardware-software complex makes demands not only on itself but also on all related services. The speed and high level of precision of its operations improve the discipline of the activities of all the telegraph networks of the republic.

"The introduction of the Telegraf hardware-software complex," said the chief engineer of the telegraph-telephone station, P. Chernyshev, "is only a small part of the large-scale program of technical reequipment of the station which was systematically begun at the beginning of the five-year plan. Over the last few years, much equipment has been introduced at the station which freed many workers, eliminated many manual operations, had a considerable economic effect and made possible an improvement in telegraph service."

The Takt equipment, for example, carries out automatic control of the working order of equipment on individual links. Defects can now be immediately eliminated. The Vremya equipment rigorously keeps track of the assigned times for transmission and reception of telegrams.

The Interval equipment is another innovation, which is now a part of the telegraph-telephone station, carries out conversion of information from the tape machine to the format necessary for reception on teletypes. This guarantees the protection of the telegraph network from distortions in the texts of telegrams. The central telegraph office is now equipped with modern teletype equipment.

In the last quarter of the present year it is proposed to install another Telegraf hardware-software complex at the central office which will automatically process through-traffic telegrams sent from the republic to all corners of the country. The arrival of an electronic concentrator is expected in the near future. Its operating principle is similar to that of the hardware-software complex but its power significantly exceeds that of the latter.

Every new electronic helper signifies thousands of rubles of savings, considerable reserves of labor power, good scheduling for the execution of telegraphic commissions and, in the final accounting, the gratitude of the clients.

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CURRENT STATUS OF PROBLEM OF USING COMPUTERS TO DEVELOP A TECHNOLOGICAL PROCESS CONTROL FUNCTIONAL SCHEMA

Moscow AVTOMATIZATSIYA I KONTROL'NO-IZMERITEL'NYYE PRIBORY V NEFTEPERERABATYVAYUSHCHEY I NEFTEKHIMICHESKOY PROMYSHLENNOSTI TEMATICHESKIY OBZOR in Russian (signed to press 14 Aug 84) pp 6-18

STEPANYAN, S. G.

[Abstract] A technological process functional schema is the major document used in designing a monitoring and automatic regulation system, reflecting all of the basic decisions concerning automation of the process. All other documents related to the design are used for practical implementation of the functional schema, ordering of equipment and materials and installation of equipment. Control systems can be divided from the standpoint of their design and as a function of technological schema complexity into four groups: traditional monitoring and automatic regulation systems, systems for technological process control, systems including computers which, in addition to processing and representing information, also develop control actions and set local system regulators to maintain optimal process conditions automatically, and systems which include microprocessor equipment for automatic regulation of individual process parameters, monitoring and primary processing of information. Design of systems for optimal control of technological conditions includes determination of the economic effectiveness and expediency of using computers. Design organizations developing technological schemas by computer can in principle solve the major problems related to automated optimal control of processors.
[141-6508]

PROGRAMS FOR CALCULATION AND SELECTION OF MONITORING AND AUTOMATIC REGULATION EQUIPMENT

Moscow AVTOMATIZATSIYA I KONTROL'NO-IZMERITEL'NYYE PRIBORY V NEFTEPERERABATYVAYUSHCHEY I NEFTEKHIMICHESKOY PROMYSHLENNOSTI TEMATICHESKIY OBZOR in Russian (signed to press 14 Aug 84) pp 18-31

STEPANYAN, S. G.

[Abstract] Programs for the design of valves and actuators have been developed at a number of organizations, mostly using the same methodology.

Several programs for design of valves and diaphragms are mentioned and briefly described. The problem of design of monitoring and automatic regulation systems can be broken down into several stages: study of the functional system, analysis of operating conditions of proposed devices, selection of hardware and modification of standard hardware devices. The programs operate with a database of devices series produced and most widely used in the design of chemical and petrochemical production facilities. Over 220 types of devices, totaling some 150,000 modifications, are included in the database. Operation of the program requires 400 Kb of RAM, at least one 29 Mb disk store.
[141-6508]

COMPOSITION OF TECHNICAL DOCUMENTATION ON MONITORING AND AUTOMATIC REGULATION PANELS

Moscow AVTOMATIZATSIYA I KONTROL'NO-IZMERITEL'NYYE PRIBORY V NEFTEPERERABATYVAYUSHCHEY I NEFTEKHIMICHESKOY PROMYSHLENNOSTI TEMATICHESKIY OBZOR in Russian (signed to press 14 Aug 84) pp 31-37

STEPANYAN, S. G.

[Abstract] Technical documentation for monitoring and automatic regulation panels should consist of drawings of the panels, a table of inscriptions on displays, a table of connections of switching systems, a list of component parts and ordering specifications for panels and parts. Programs have been written to produce almost all the documents required by the standards. By late 1985 technical documentation for monitoring and automatic regulation panels should be used entirely automatically. The major tasks performed by the BASHITM automatic computerized control panel design program include balanced arrangement of panels of up to sixty instruments, selection of additional devices, calculation of the necessary number of circuit breakers and automation devices, arrangement of additional hardware on internal surfaces of the panel, up to 200 devices, production of drawings and production of parts lists. The system, consisting of some 30 modules, is briefly described.
[141-6508]

MONITORING AND AUTOMATIC REGULATION AUTOMATED DESIGN SUBSYSTEM

Moscow AVTOMATIZATSIYA I KONTROL'NO-IZMERITEL'NYYE PRIBORY V NEFTEPERERABATYVAYUSHCHEY I NEFTEKHIMICHESKOY PROMYSHLENNOSTI TEMATICHESKIY OBZOR in Russian (signed to press 14 Aug 84) pp 38-41

STEPANYAN, S. G.

[Abstract] Some data from the literature on several monitoring and automatic regulation systems are presented. A system for automated design of technological process monitoring and automatic regulation sytems called

UDC: 007.52:621

ALGORITHMIC SUPPORT FOR CONTROL SYSTEMS OF FLEXIBLE AUTOMATIC PRODUCTION FACILITIES

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84 (manuscript received 20 Apr 81; after revision 23 Jun 84) pp 3-7

DOVBNYA, N. M., NOVACHENKO, S. I. and YUREVICH, Ye. I. (Leningrad Polytechnical Institute)

[Abstract] An example implementation of a software system for the control of a welding sector of a flexible production facility, developed at Leningrad Polytechnical Institute imeni M. I. Kalinin, is analyzed. The sector in question is used for assembly of storage tanks by welding of component parts. The process includes an assembly unit, four industrial robots, four control devices and an ASVP M6000 computer. The input information for the controlled devices consists of values of assigned coordinates determined by calculations and the number of the program providing for the assigned operating conditions of the process equipment. The software is modular, consisting of system software and functional units. The software can be modified for use in other processes by production of a limited number of functional units, all system units remaining unchanged. The use of this standardized software can significantly accelerate the process of development and introduction of flexible automated facilities. The same software has been posted to the Elektronika-60 for control of shop level transportation-warehouse operations. [151-6508]

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RESEARCH HARDWARE SYSTEM BASED ON COMPUTER VIDEO TERMINAL

Kiev UPRAVLYAYUSHCHIYE SISTEMY I MASHINY in Russian No 6, Nov-Dec 84 (manuscript received 13 Dec 83) pp 100-102

KASHKIROV, A. A., MARUSEV, V. I., TEMNOYEVA, T. A., UL'YANOV, V. Yu. and FEDOROV, Yu. D. (Scientific Research Institute of Nuclear Reactors imeni V. I. Lenin, Dimitrovgrad)

[Abstract] A two-level automated system for measurement, monitoring and processing of physical quantities has been developed at the Scientific Research Institute of Nuclear Reactors imeni V. I. Lenin and is now undergoing experimental testing. At the lower level is a research hardware system based on a computer video terminal. The upper level is a BESM-6 multiuser computer. The KADROED terminal system used consists of devices connected to a display which is used as buffer storage for experimental data and an ordinary alphanumeric computer terminal. A controller, control panel and connection panel have been specially developed for the KADROED system. Utilization of the device in experimental studies is described. The area of application of the system depends largely on the characteristics of the

display used: its information capacity, speed of the communications channel with the computer and its functional capabilities. These characteristics are quite suitable for automation of experimental and technological studies of various types. Figure 1, references 4 Russian.
[151-6598]

KONET COMPUTER LINK SYSTEM

Tallin SOVETSKAYA ESTONIYA 1 June p 2

[Unsigned article "KONET Goes to Hungary"]

[Text] The Hungarian electronic technology firm Videoton has acquired a licence to produce the industrial system for data transmission KONET (ILPS-2) created by scientists of the Academy of Sciences EsSSR Cybernetic Institute. A correspondent of the ETA (Estonian Telegraph Agency) met with the design director in charge of the control systems sector of the institute, Raul Tavast, before his trip to the fraternal country and asked him to describe the innovation.

"The computerization of various branches of the economy of our country and countries which are memebers of CEMA is one of the current problems for scientists," he said. "Today the computer is already not a novelty in factories plants and combines. But the process of introducing electronic technology has produced its own problems, one of which is the connection of tens of computers into a single flexible system. In many enterprises, in order to solve particular problems, it was rational to use only mini- and microcomputers and not powerful computers requiring extensive programming and large staffs of programmers, etc.. It was just for this reason that it was decided to find a method for connecting computers into a single system. And we were able to do this. By means of special microprocessor units we are able to connect more than sixty small computers by means of a reliable and rapid link."

Correspondent: "What is the practical application of the KONET system?"

"This year KONET will be introduced at the Payde combine for milk products where it will be able to control production at all levels. It was decided that later all the milk enterprises and then the meat industry of the republic will be equipped with these systems. On the basis of the Payde combine we have already acquainted specialists in these sectors with our technology and it has aroused a great deal of interest amongst them. It can be said that our institute together with specialists from different ministries have organized one of the first schools in the republic for the introduction of industrial electronic technology."

Correspondent: "What are the advantages of the KONET system in relation to conventional methods for connecting computers?"

"Firstly, the system is universal and flexible. It can be easily assembled in any enterprise. For example in the combine we mentioned one and a half kilometers of cable link all the computers located at different industrial control levels. This means that all the information and all commands and statistical data

will always be visible on the display screens and will also be continuously written into the computer memory. Secondly, the system makes it possible to increase the overall power of the automatic control system. The best evaluation of our work can probably be considered to be the fact that KONET (ILPS-2) was recently adopted as standard for small computers in countries which are members of CEMA.

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